GLOBAL CLIMATE BULLETIN

n°225 – March 2018

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I. DESCRIPTION OF THE CLIMATE SYSTEM (January 2018)

I.1.Oceanic analysis

Over the Pacific ocean :

La Nina phenomenon has passed its maximum and started its decline in January

- Along the equator, cold anomalies remain well marked on the surface East of the date line, and weak to moderate warm anomalies persist in the west. The trend in surface since December is not homogeneous, however the NINO 3.4 index has risen to -0.6 ° C in January.
  In the subsurface, the evolution is much more frank with a spectacular disappearance of the deep reservoir of cold water east of the basin due to the rapid progression of a Kelvin wave clearly visible on the Hovmüller diagram.
- In the northern hemisphere, slow evolution since December rather in the direction of strengthening a PDO+ structure. NOAA PDO index returns positive in January : +0.24
- In the southern hemisphere, the hot anomaly remains very strong around New Zealand, despite a negative trend since December.

Over the Indian Ocean :

- very important cooling especially in the southern hemisphere. Cold anomalies become strong near the African coast, in southern Madagascar, on the southern edge of the equator and in the vicinity of Australia.

Over the Atlantic:

- weak warm anomalies prevail except near the coasts of West Africa and in the Cold Blob.

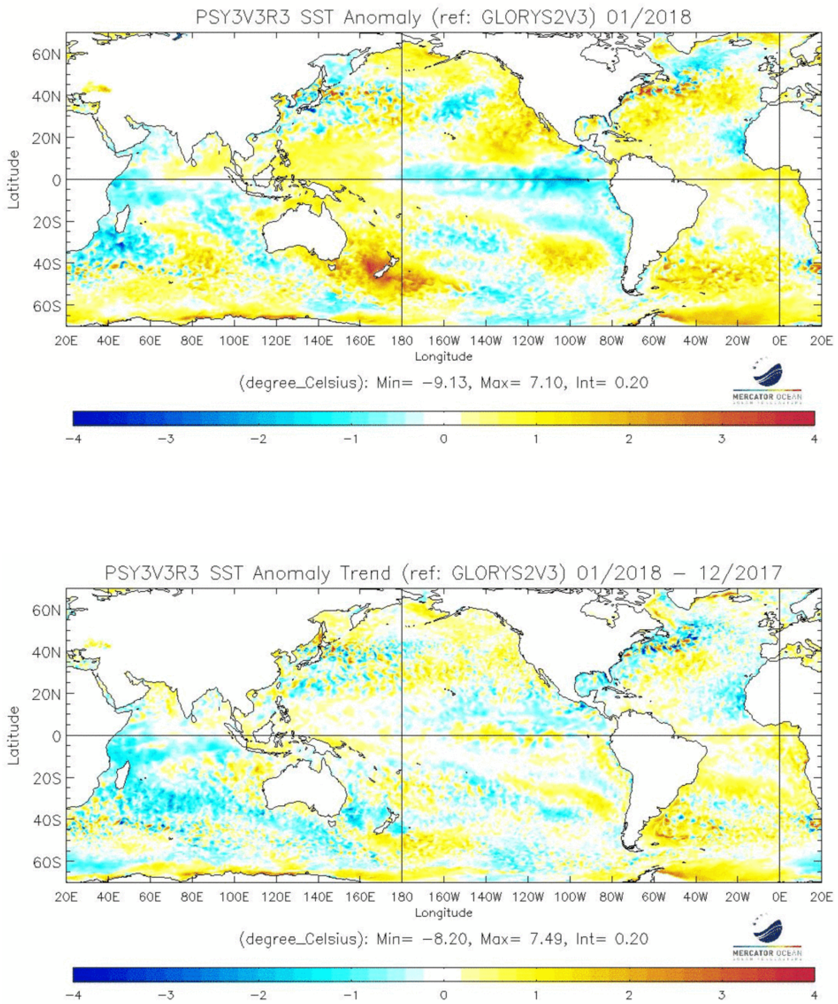


fig.I.1.1: top : SST Anomalies (°C) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2013).

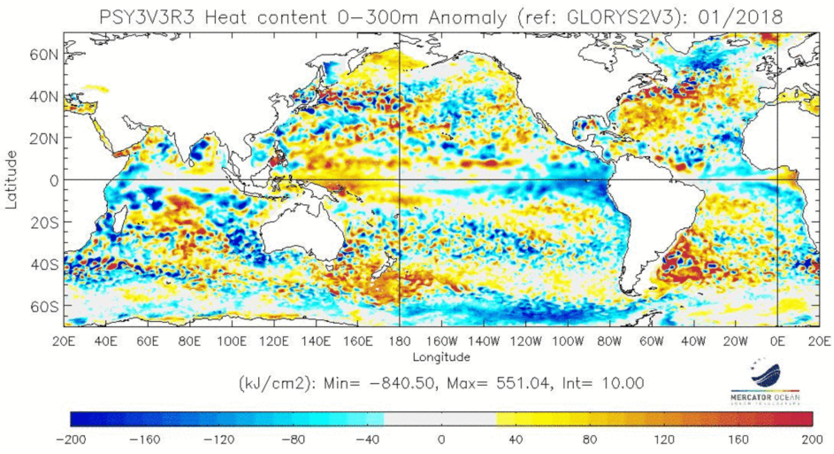


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

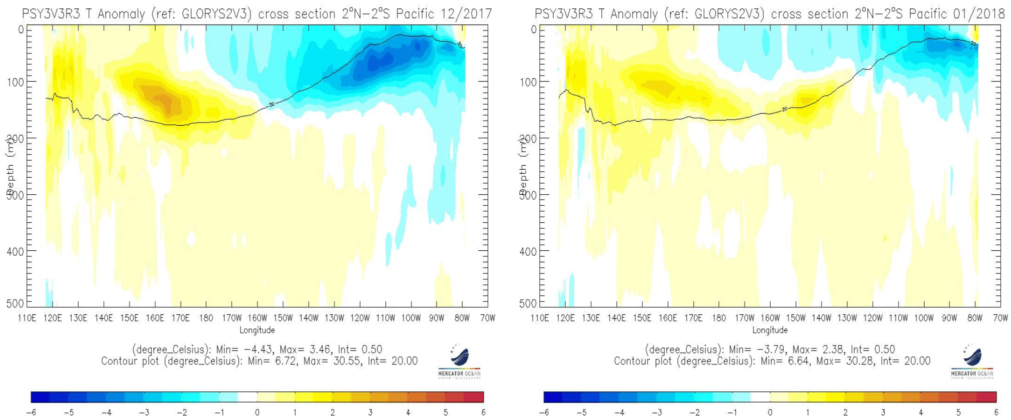


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

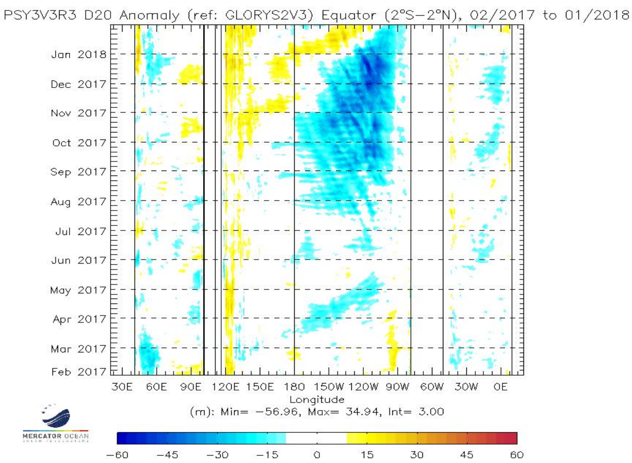


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period

__**Sea surface temperature near Europe :**__

European Arctic Sea: Still warmer than normal, no significant change of anomalies

North Sea: close to normal, no significant change.

Baltic Sea: normal to above normal, not much change of anomalies, only small parts were frozen.

Cold blob south of Greenland/Iceland: still persisting, no significant change.

Subtropical East Atlantic: mainly warmer than normal, no significant change.

Mediterranean: Only little and very scattered anomalies. Compared to December 2017, western Mediterranean's negative anomalies decreased to about zero, which means seasonal cooling was weaker than usual. SST in the easternmost part of the basin (near Turkey, Middle East) still slightly warmer than normal, no significant change of anomalies.

Black Sea: warmer than normal, especially in the east, increasing anomalies compared to December.

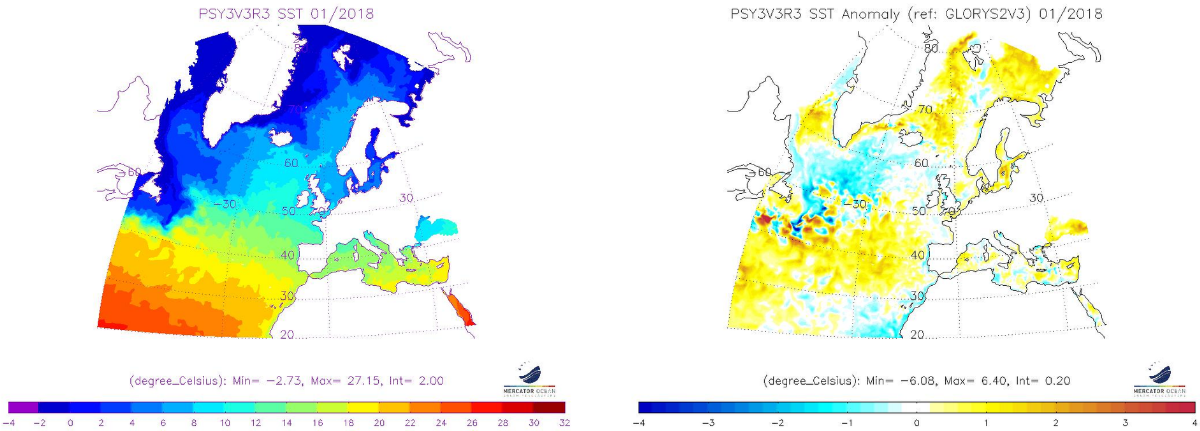


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

I.2. ATMOSPHERE

I.2.a General Circulation

Velocity Potential Anomaly field in the high troposphere (fig. 1.2.1. a – insight into Hadley-Walker circulation anomalies) :

- Strong upward motion anomaly area on the Maritime Continent extended North to Eastern Asia and South to Australia.
- in the contrary, strong downward motion anomaly area over Africa and the Western Indian Ocean.
- Elsewhere, the anomalies are rather subsident but weak and unstructured.
- This overall configuration is consistent with the La Nina situation and reinforced by the activity of the MJO during the month between the Indian Ocean and the West Pacific.

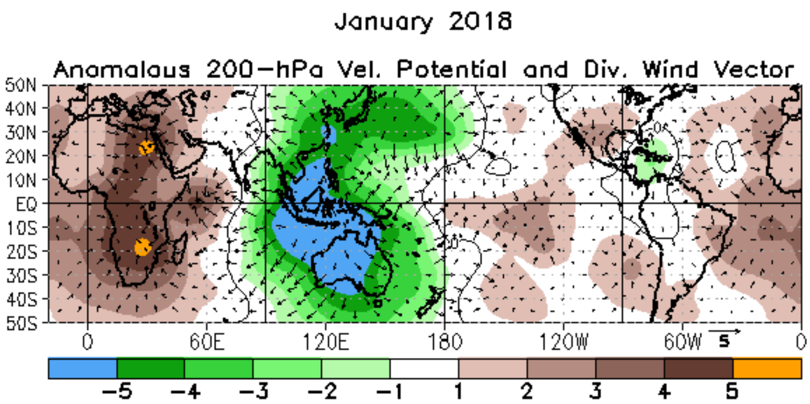


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- See NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/ .
- SOI index : +1.1

MJO (fig. I.2.1.b)

- active MJO during the month between the Indian Ocean and the West Pacific.

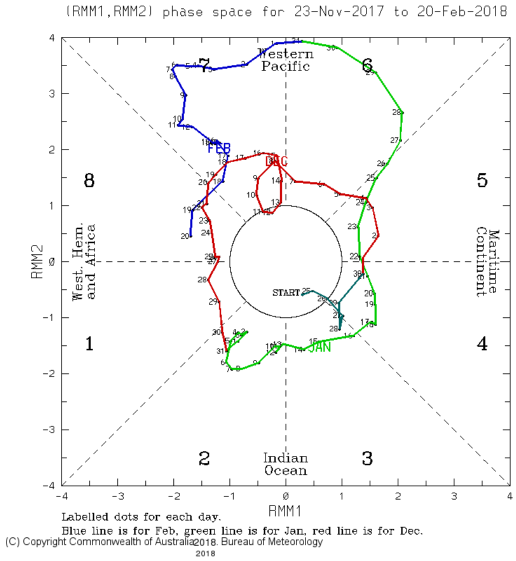


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

Stream Function anomalies in the high troposphere (fig. 1.2.2 – insight into teleconnection patterns tropically forced):

- in response to the upward motion anomaly on the Maritime Continent, strong anticyclonic anomaly at 200hPa over southern Asia and symmetrically over the southern Indian Ocean.
- on the Pacific the repercussions of the La Nina configuration are softer and do not spread at mid-latitudes.
- PNA index : +0.4

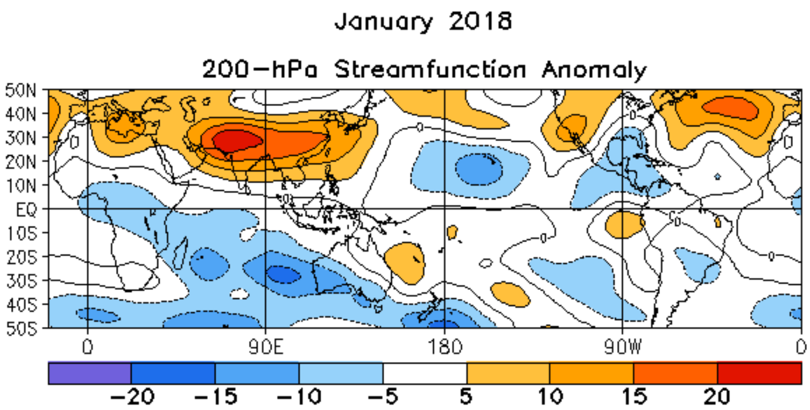


fig.I.2.2: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig.1.2.3 – insight into mid-latitude general circulation):

- On the Atlantic: positive anomaly between 30 ° N and 45 ° N, negative further north extending by a thalweg on northwestern Europe and the west of the Mediterranean basin. Strong positive anomaly over Russia and western Siberia.

- On North America, negative anomaly in the Gulf of Alaska, positive on the western United States and Canada

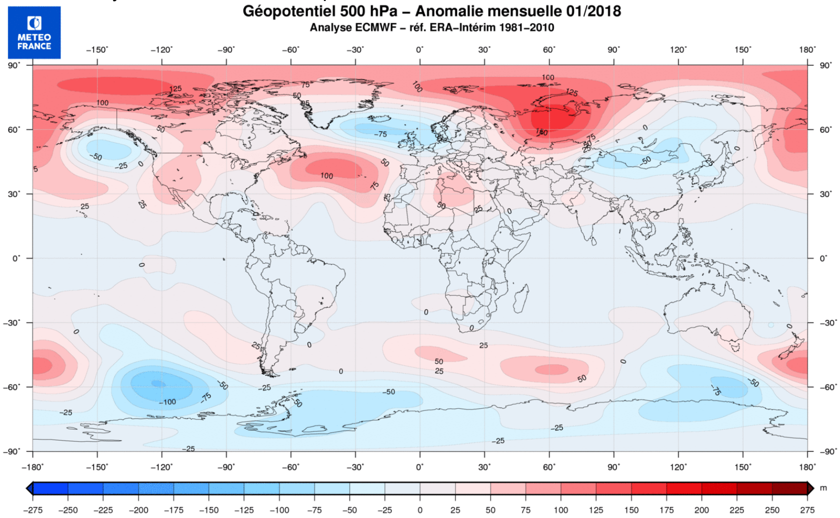


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
JAN 18	1.2	0.6	0.4	0.7	-0.1	-0.3	-1.6	0.4	-1.5
DEC 17	0.7	-0.5	0.3	---	0.6	1.0	-1.6	-0.5	-2.0
NOV 17	-0.1	0.1	0.7	0.4	-2.0	---	-1.2	-0.1	-2.2
OCT 17	0.7	0.6	0.7	-0.6	-0.3	---	0.0	0.3	-1.2
SEP 17	-0.5	1.6	-1.2	-0.5	-0.3	---	-2.5	0.5	-1.7
AUG 17	-1.5	2.0	-1.4	-1.6	0.2	---	-2.9	-1.6	1.8
JUL 17	1.3	1.8	0.5	0.0	1.3	---	-0.6	0.0	-0.1
JUN 17	0.4	2.0	-0.8	0.5	1.2	---	0.3	-1.4	-0.1
MAY 17	-1.7	0.5	0.7	-0.7	-0.2	---	1.5	0.9	0.5
APR 17	1.7	-0.6	-0.4	1.0	0.1	---	0.7	-1.5	-1.4

Evolution of the main atmospheric indices for the Northern Hemisphere for the last 6 months. (see http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml for the most recent 13 months).

Sea level pressure and circulation types over Europe

Very distinct NAO+ pattern, both Icelandic Low and Azores High more intense than normal, and zonal flow throughout the North Atlantic on monthly average. Anomalies, however, show an asymmetric pattern, for the Icelandic Low extending more to the east up to the North Sea, for the Azores High more to the west. This SLP pattern was very similar to the upper atmosphere. The asymmetry was triggered by a weak EA+ pattern, which caused a more southern location of the low pressure zone over the East Atlantic.

Furthermore, the Siberian High was more intense than normal, forming a dipole with the low over northwestern Europe, very similar to December. Once again, Europe was not influenced by any continental cold air from the east, but rather from warm subtropical air masses and from mild and humid Atlantic air masses with several storms passing over Central Europe.

MF weather type classification shows a high frequency of NAO+ (15 days). The remaining days had meridional patterns (Atlantic ridge 8 days, Scandinavian blocking 8 days). Hess-Brezowsky classification similarly has a high frequency of westerly cyclonic types (16 days).

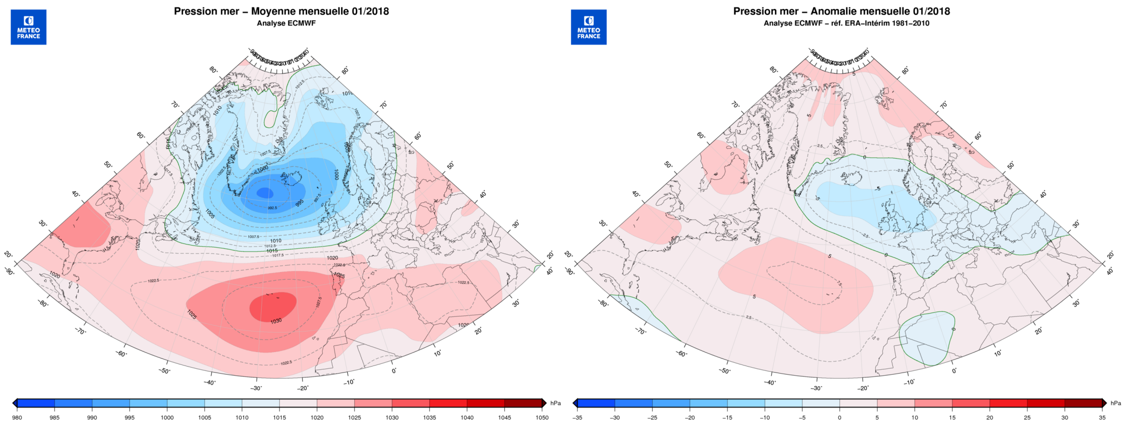


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

<u>Circulation indices: NAO and AO</u>

NAO was in a positive phase during the whole month, which started already in early December and intensified from mid-January onwards.

In contrast, AO showed quite a strong short-term variability during January, but in the second half of the month, variability followed that of NAO with a dominating positive phase, which means little and short influence of Arctic cold air outbreaks (and the Arctic air was relatively mild anyway).

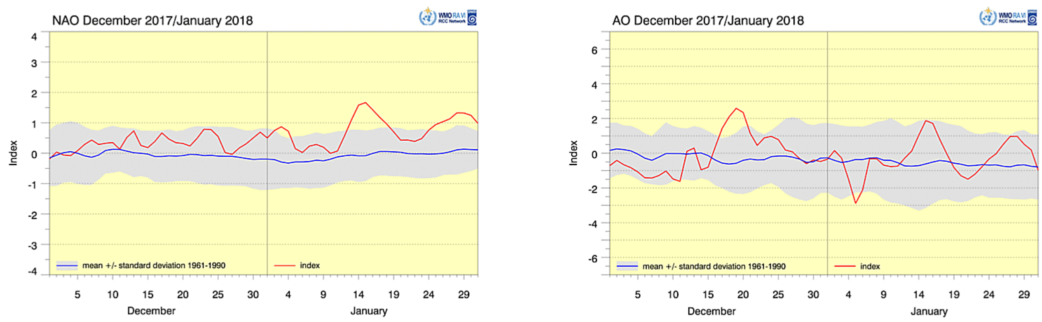


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

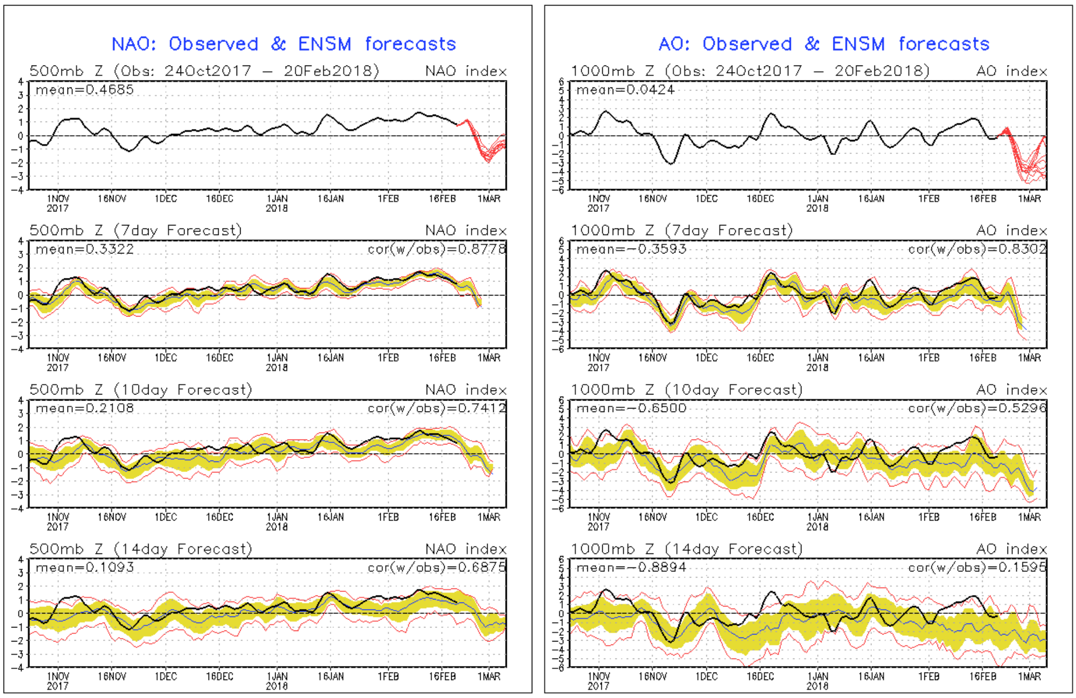


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

- In the equatorial band, consistent with SST anomalies and velocity potential at 200 hPa, above normal precipitation over the Continent Maritime. Deficit of precipitation along the equator on the Indian Ocean and the Pacific Ocean.
- Deficit also on Brazil and South of Africa.

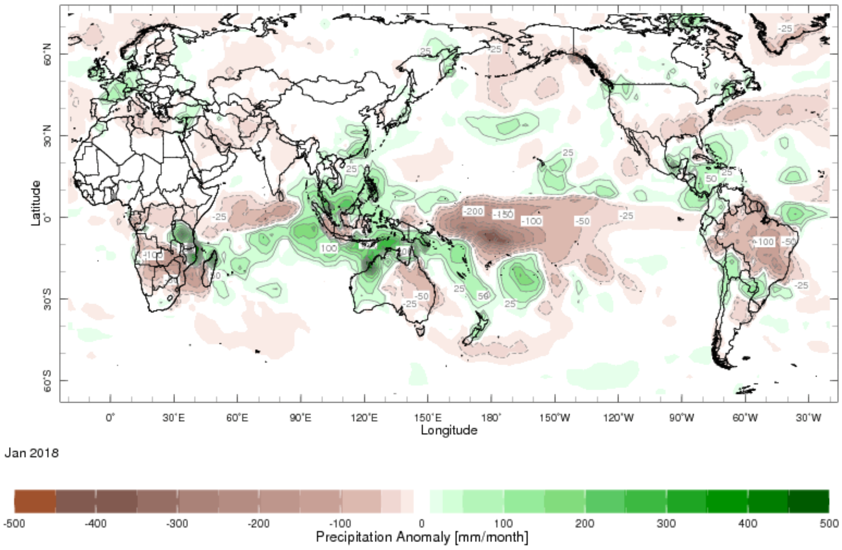


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal).
Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

January was particularly wet over northwestern, western and central Europe, especially over large parts of France, Switzerland and southwestern Germany. In the Alps large snow accumulation in higher elevations. This is due to some intense Atlantic frontal systems but also troughs extending from northwest. In contrast, much of the Mediterranean region was relatively dry due to frequent subtropical high pressure situations, except the easternmost part.

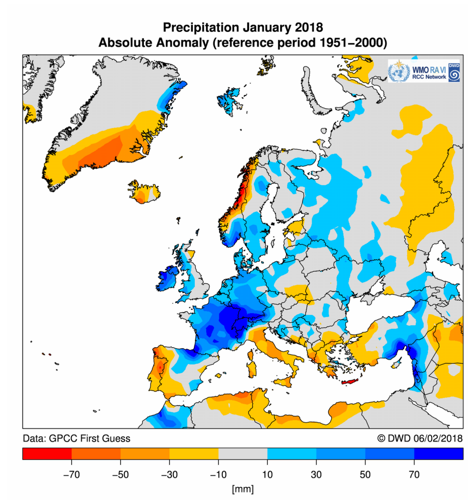


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

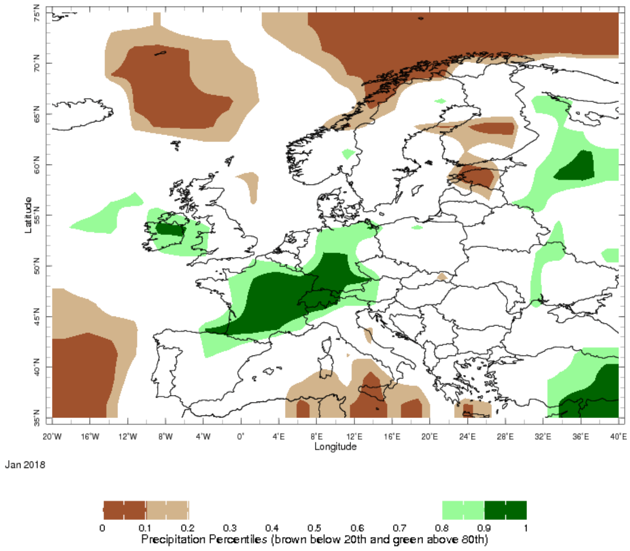


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

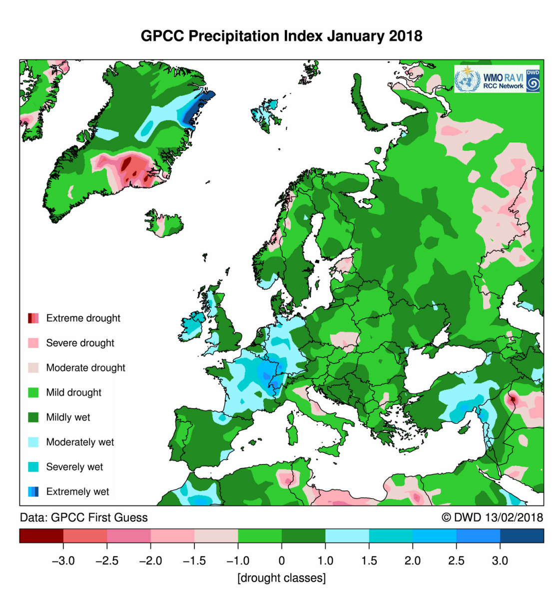


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

Monthly mean precipitation anomalies in European subregions. Subregions refer to ECMWF land boxes defined in Annex III.3. Anomalies are based on gridded data from GPCC First Guess Product, ftp://ftp-anon.dwd.de/pub/data/gpcc/PDF/GPCC_intro_products_2008.pdf, 1951-2000 reference.

Subregion	**Absolute anomaly**	**GPCC Drought Index**
Northern Europe	+ 12.2 mm	+ 0.260
Southern Europe	+ 1.5 mm	+ 0.247

Please note: new drought index since January 2016. The GPCC drought index, which also considers evaporation in addition to precipitation replaces the former SPI-DWD.

I.2.c Temperature

- still very strong positive anomalies on the Arctic, and the surrounding areas: northern Siberia, Canada, and Alaska.
- Strong warm anomaly from Europe to Middle-East. Cold anomaly on Central Asia.
- Strong warm anomaly over Western United States and Mexico. Cold anomaly on Eastern North America.

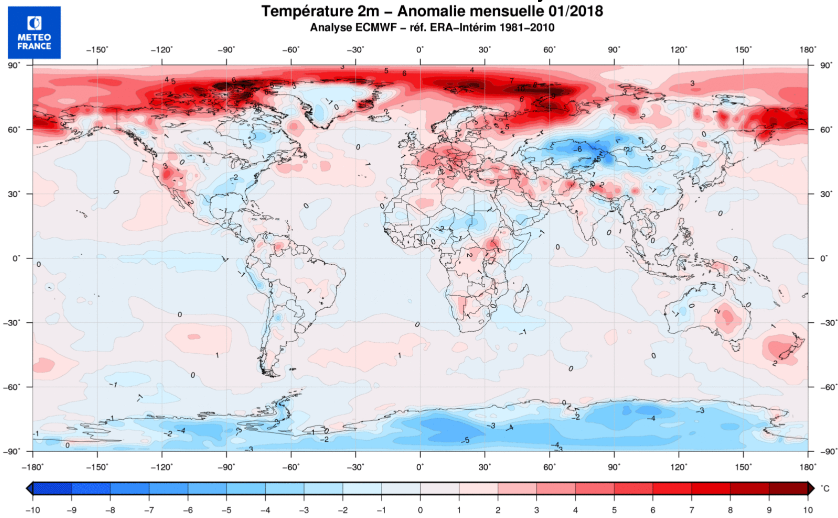


fig.I.2.9: Temperature Anomalies (°C) (Meteo-France)

Temperature anomalies in Europe:

January was a very mild month for much of Europe, especially in France, Central Europe and Central Mediterranean as a result of the combined influence of mild Atlantic air flow and subtropical air advection. Northeastern Europe was very mild too due to some Siberian High blocking situations.

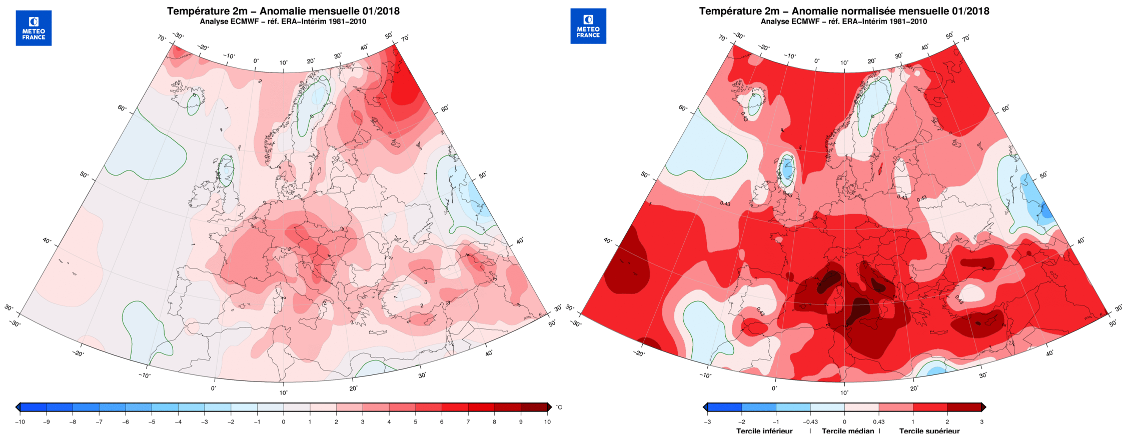


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

Monthly mean temperature anomalies in European subregions: Subregions refer to ECMWF land boxes defined in Annex III.3. Anomalies are based on gridded CLIMAT data from DWD, http://www.dwd.de/rcc-cm, 1961-1990 reference.

Subregion	Anomaly
Northern Europe	+ 2.1 °C
Southern Europe	+ 2.3 °C

I.2.d Sea ice

- In the Arctic : new record of weak expansion of the pack ice in January.
- In Antarctica the deficit is also still very important, with values near -2 SD.

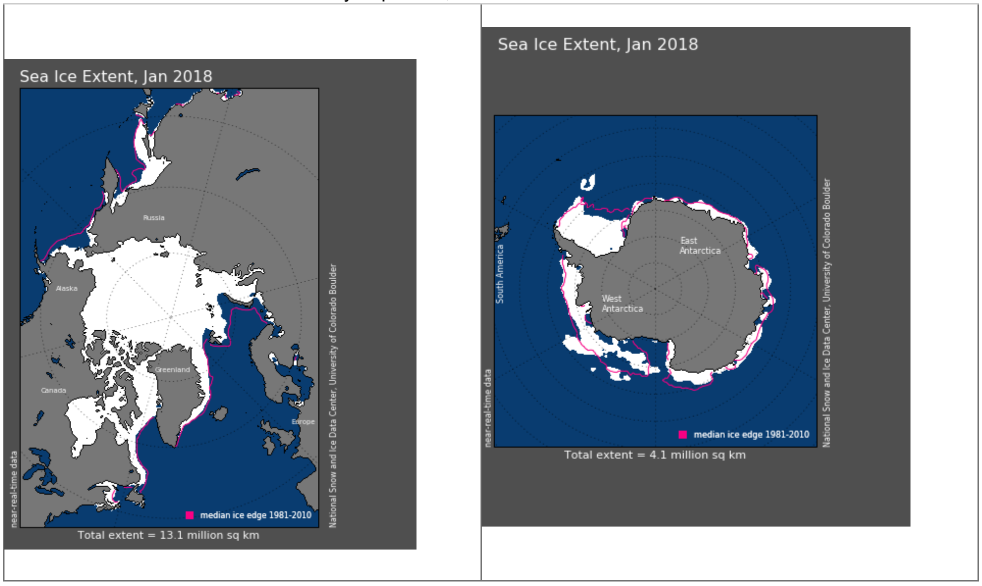


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

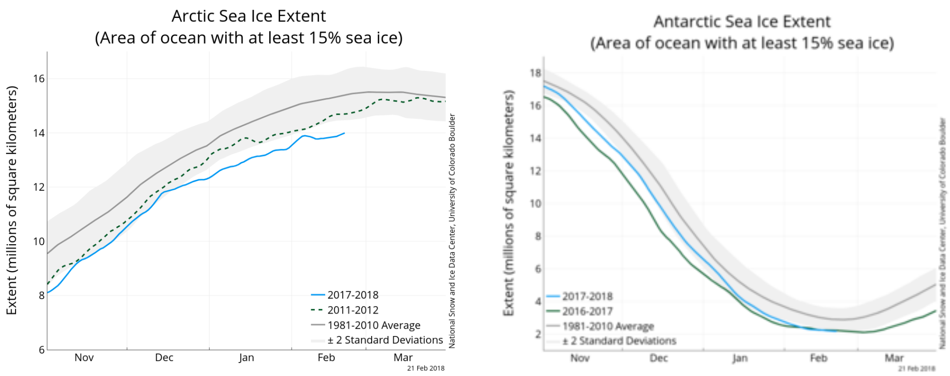
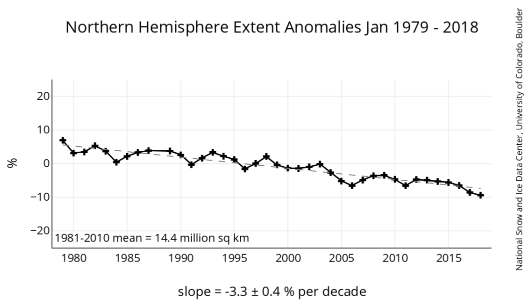


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images /daily_images/N_stddev_timeseries.png



Monthly Sea Ice Extent Anomaly Graph in Arctic for the month of analysis.
http://nsidc.org/data/seaice_index/images/n_plot_hires.png

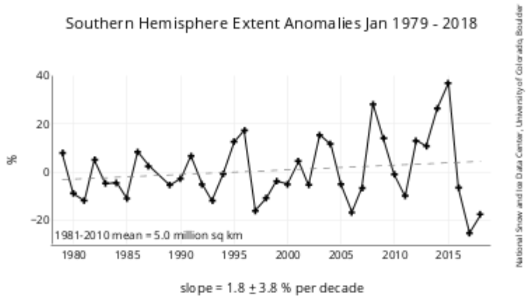


fig 1.2.13 : Monthly Sea Ice Extent Anomaly Graph in Antarctic for the month of analysis (http://nsidc.org/data/seaice_index/)

II. SEASONAL FORECAST FROM DYNAMICAL MODELS

The La Niña phenomenon will begin to decline in the next 3 months.

II.1. OCEANIC FORECASTS

II.1.a Sea surface temperature (SST, figure II.1.1 to II.1.4)

MF-S5 is struggling to trigger the end of the La Nina phenomenon, it remains colder than all other models in the equatorial Pacific zone. We will choose the more consensual scenario of a frank mitigation of the phenomenon during the next 3 months.

- Pacific Ocean: On average along the equator, the SST anomaly in the next 3 months will remain negative but significantly reduced. Similarly, the eastern part of the southern intertropical zone will remain abnormally cold.
- The North Pacific is expected to be warmer than normal with strong anomalies near the Bering Strait, in the central basin and off the coast of California. No more visible PDO structure in the forecast.
- In the southern hemisphere, the hot anomaly will remain very strong around New Zealand, even though it is being attenuated.
- Indian Ocean: Neutral conditions in the northern hemisphere, and warmer than normal in the southern hemisphere. The cold anomaly that had persisted for several months in the southeastern part of the basin is expected to be largely filled in the next 3 months.
- Atlantic Ocean: the equatorial band is predicted neutral by most of the models, with cold anomalies on both sides in the north and south inter-tropical bands. The NCEP model has a less cold forecast and MF-system 6 is developing a small hot anomaly just along the eastern part of the equator.
  No change expected in the northern hemisphere with still hot anomalies between 30 ° N and 45 ° N, a cold anomaly zone further north, especially in the Cold Blob area, still well marked. Strong hot anomaly expected in the high latitudes.
  In the southern hemisphere, hot anomaly predicted south of 30 ° S.
- Mediterranean Sea : Positive anomalies are mainly predicted by the models, especially in the eastern part of the basin.

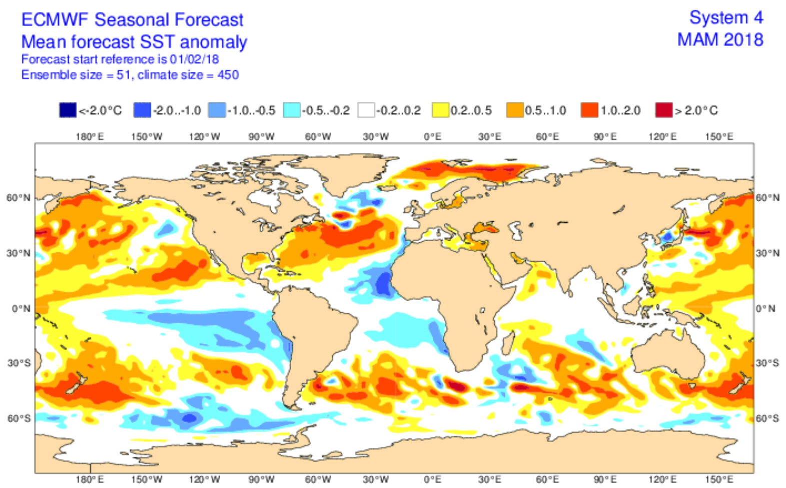


fig.II.1.1: SST anomaly forecast from ECMWF
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

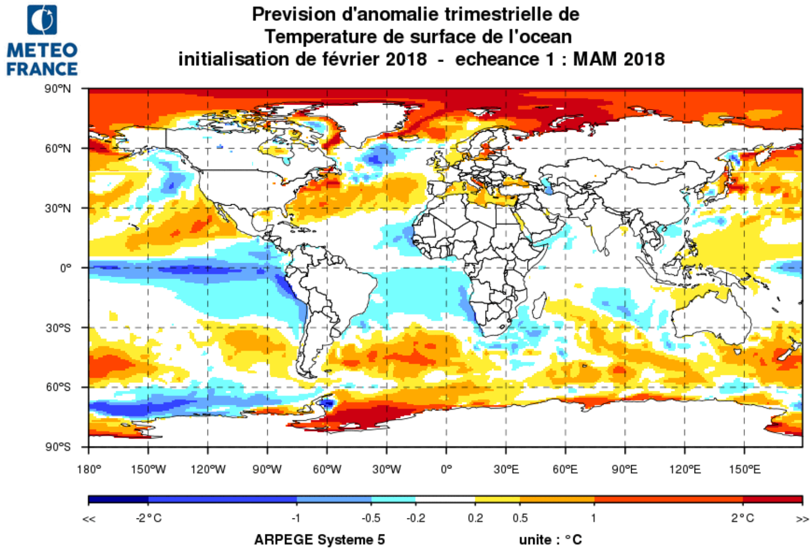


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://seasonal.meteo.fr

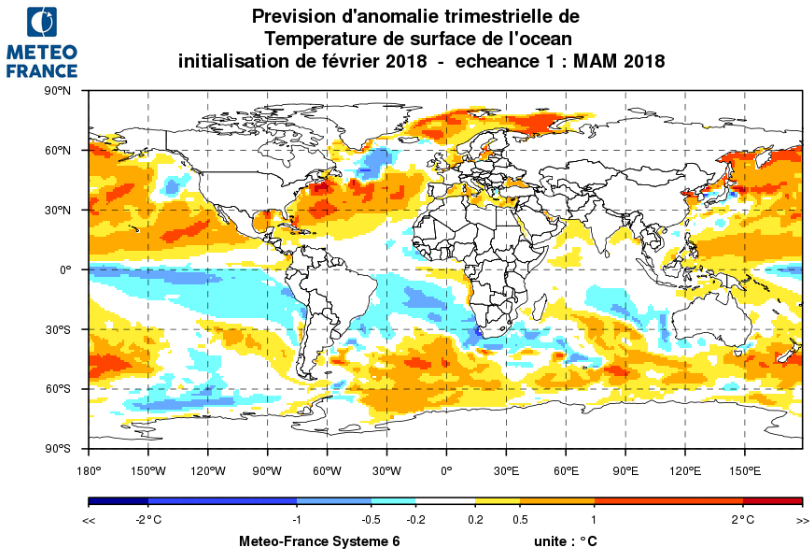


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://seasonal.meteo.fr

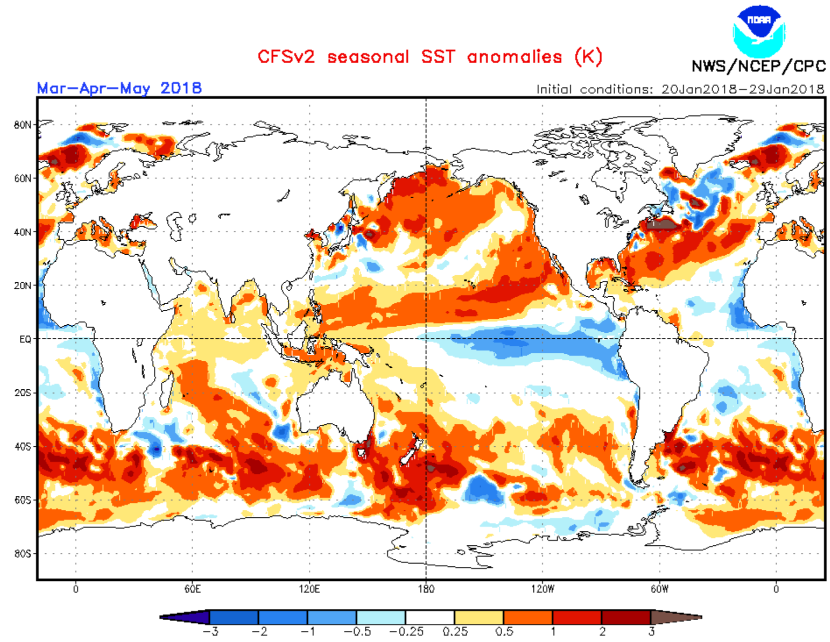


fig.II.1.3: SST Anomaly forecast from NCEP.
http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

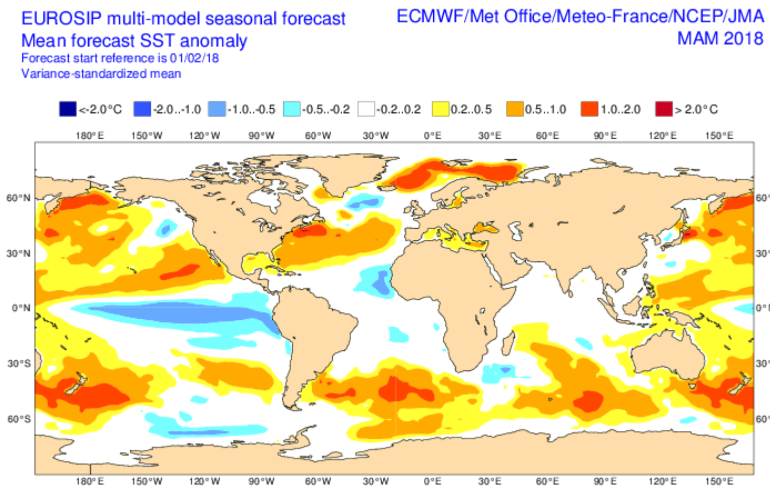


fig.II.1.4: SST Forecasted anomaly from Euro-SIP

II.1.b ENSO forecast :

***Forecast Phase*: back to a neutral phase during the next 3 months.** The synthesis of the IRI predicts a neutral phase with a probability of more than 50%.

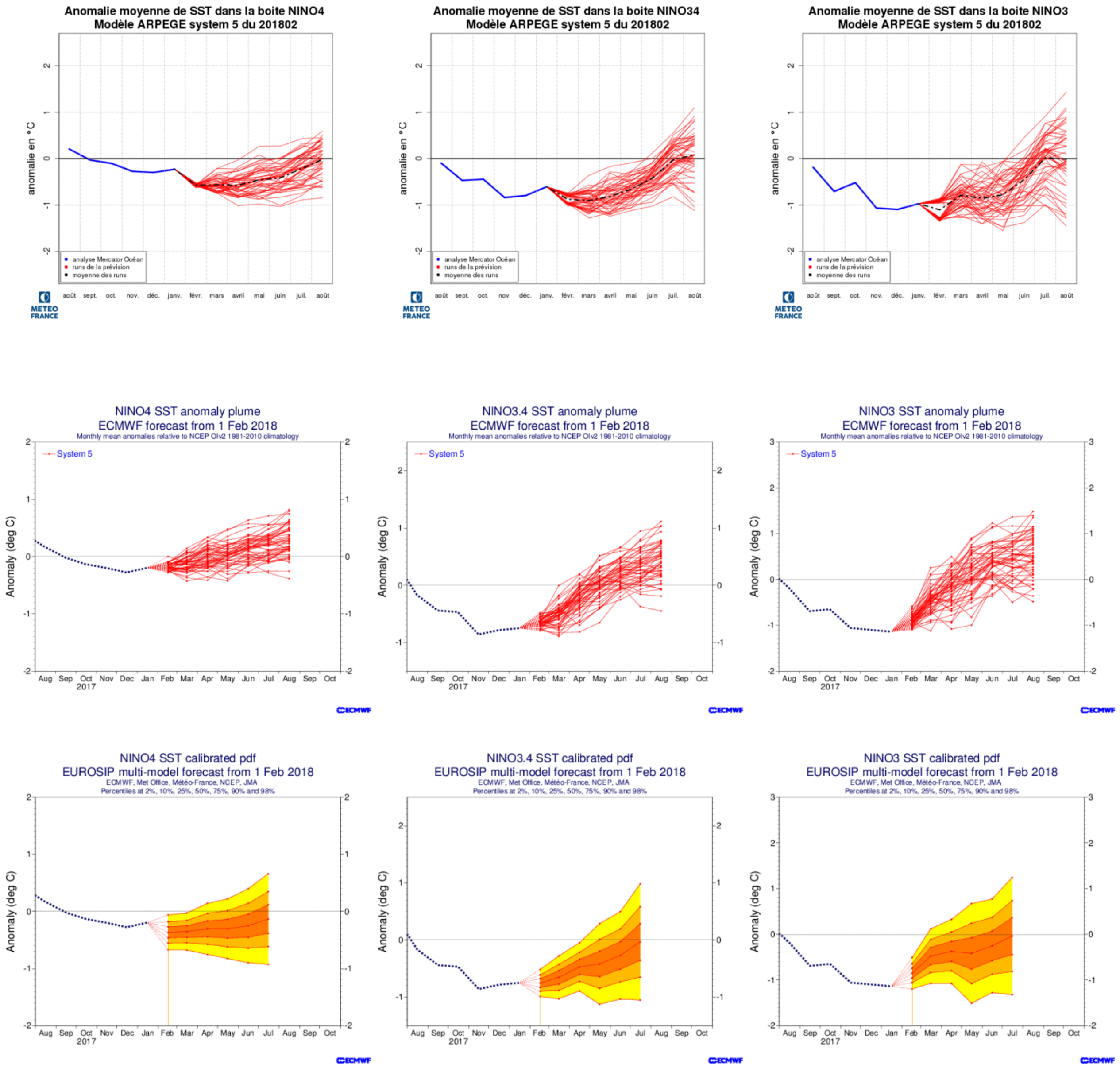
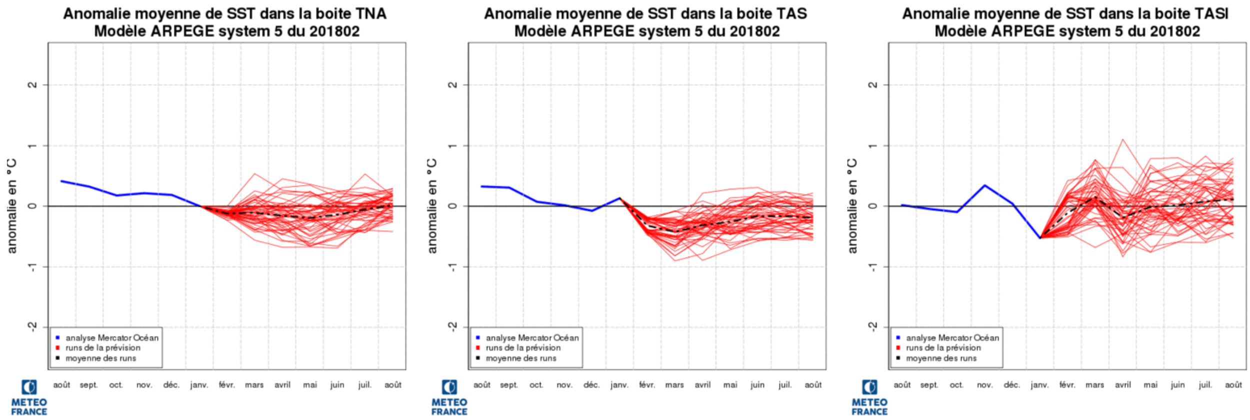


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EUROSIP (bottom) – recalibrated distributions - (http://seasonal.meteo.fr , http://www.ecmwf.int/)

I.1.c Atlantic ocean forecasts



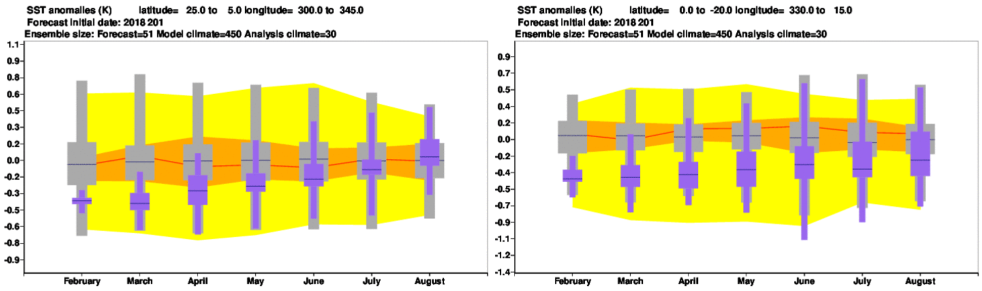


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

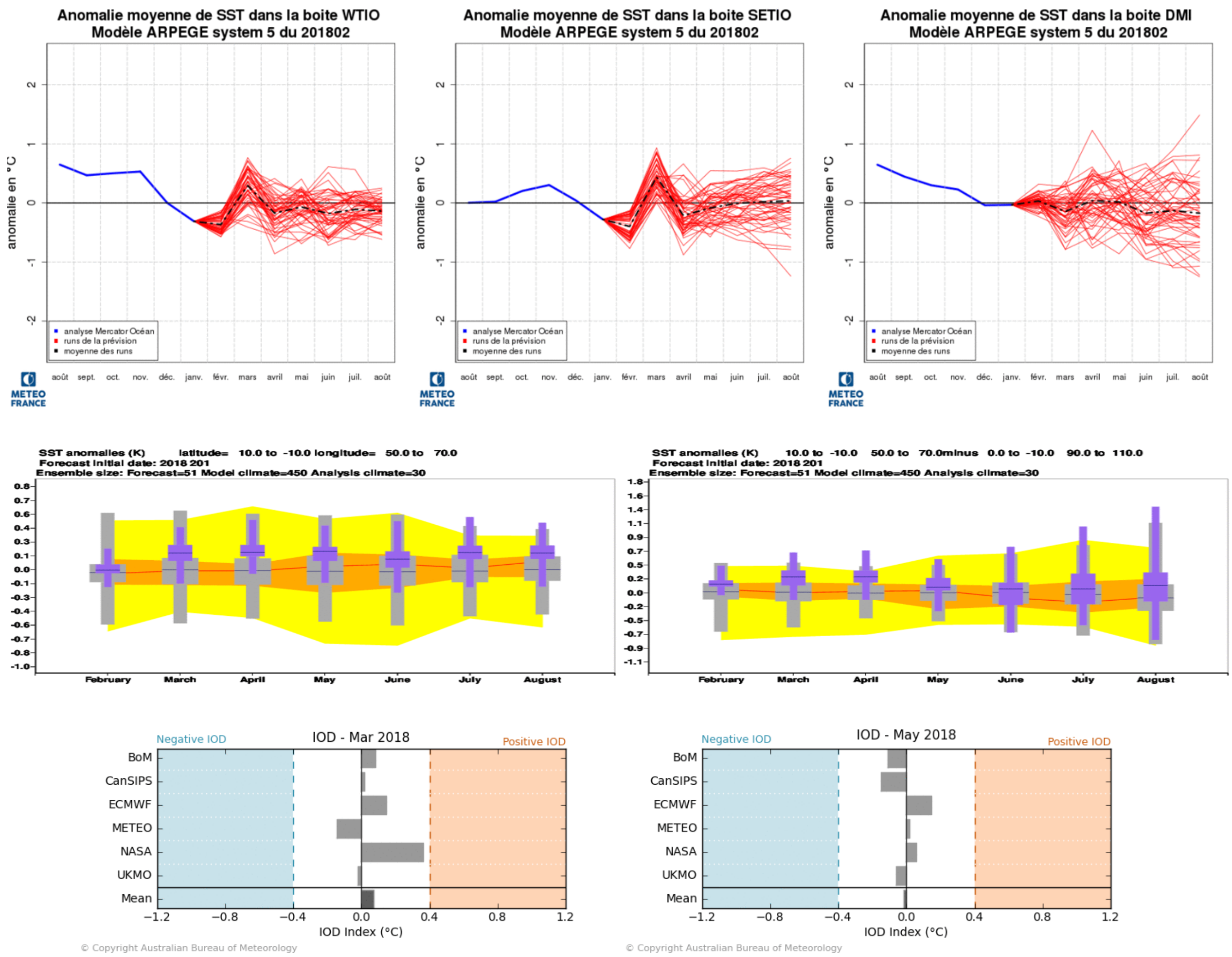


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Velocity potential anomaly field and Stream Function anomaly field

The models are in pretty good agreement on the Pacific and the Maritime Continent. On the other hand, they differ sharply on the Atlantic, Africa and Europe.

- Velocity potential :
  - The forecasted anomaly of upward motion on the Maritime Continent and Southeast Asia is similar in MF and ECMWF. The expected subsidence zone on the Pacific is also quite similar although a little more stronger and southerly with MF-S6. On the other hand, an upward motion anomaly zone, predicted by MF on Africa and the Atlantic equatorial band, is not at all anticipated by ECMWF.
- Stream Function :
  - MF-S6 and ECMWF5 are fairly consistent in their well-marked response to Nina forcing in the Pacific and the teleconnection extension to North America. They are however diverging everywhere else.

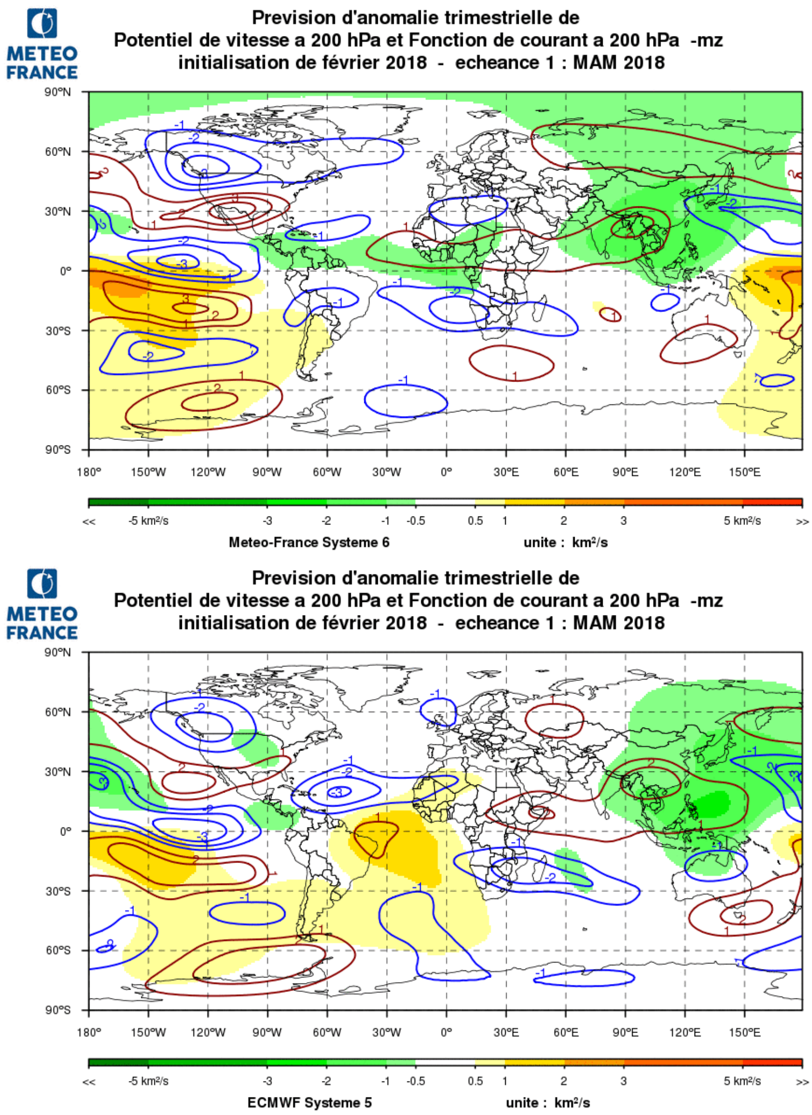


fig.II.2.a: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly),
associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ
(isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).
http://seasonal.meteo.fr

II.2.b Geopotential height anomalies

MF-S5 is to cold and not usable this months. We'll used MF-S6 instead.

In MF-S6 and ECMWF-S5 we find the similar elements of the general structure of the Z500 field even though MF-S6 is more contrasted for both positive and negative anomalies.

For Europe, the predicted Z500 anomaly fields are very different. MF-S6 forecasts high values for Europe and limits the negative anomaly to the North Atlantic when ECMWF-S5 shifts it further to the East and sinks it over a large Northwestern part of the continent.

The MF-S6 solution clearly favors an NAO + mode. ECMWF-S5 is less clear

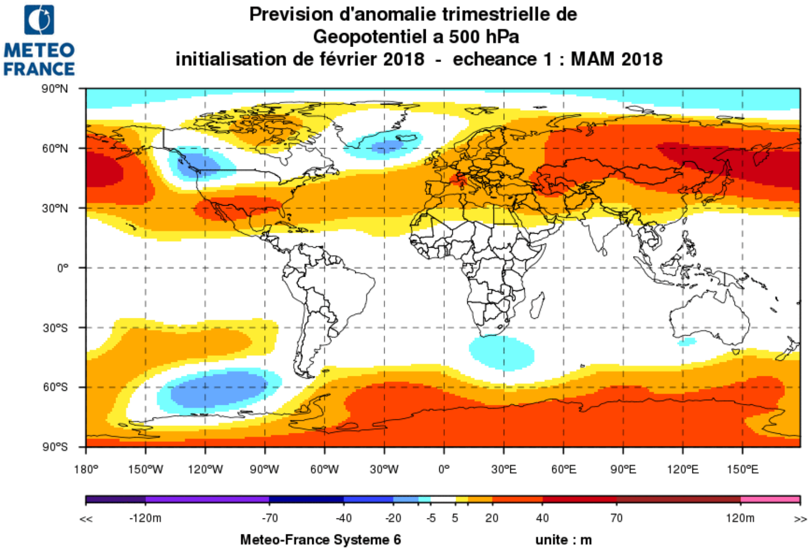


fig.II.2.b.1: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

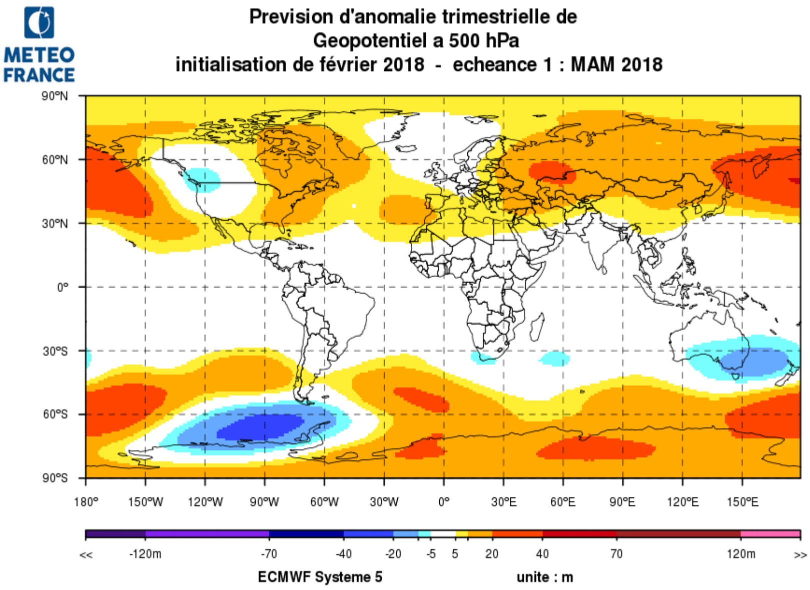


fig.II.2.b.2: Anomalies of Geopotential Height at 500 hPa from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast

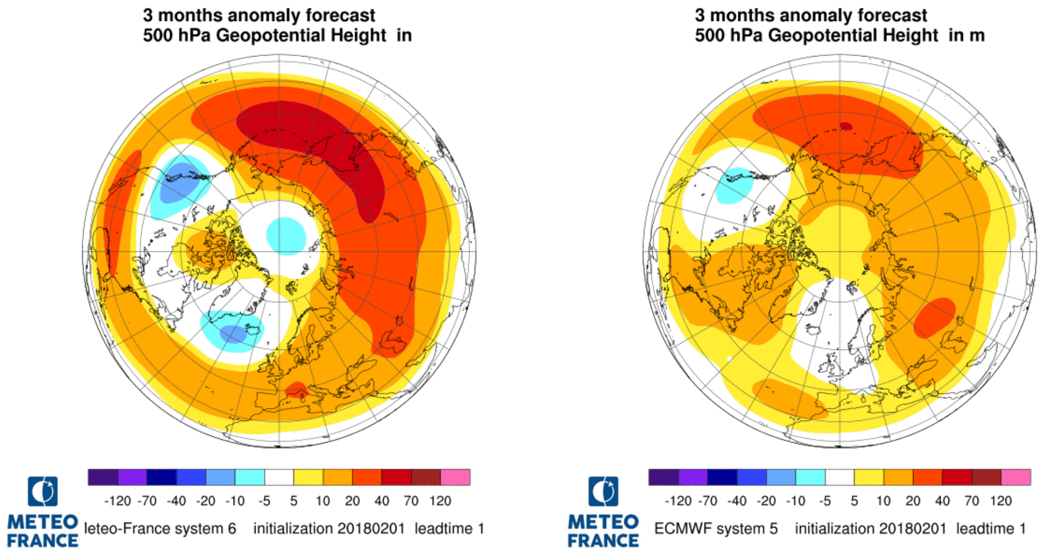


fig.II.2.b.1: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

II.2.c. modes of variability

Only MF-S5 forecasts are available and it is not useable this months

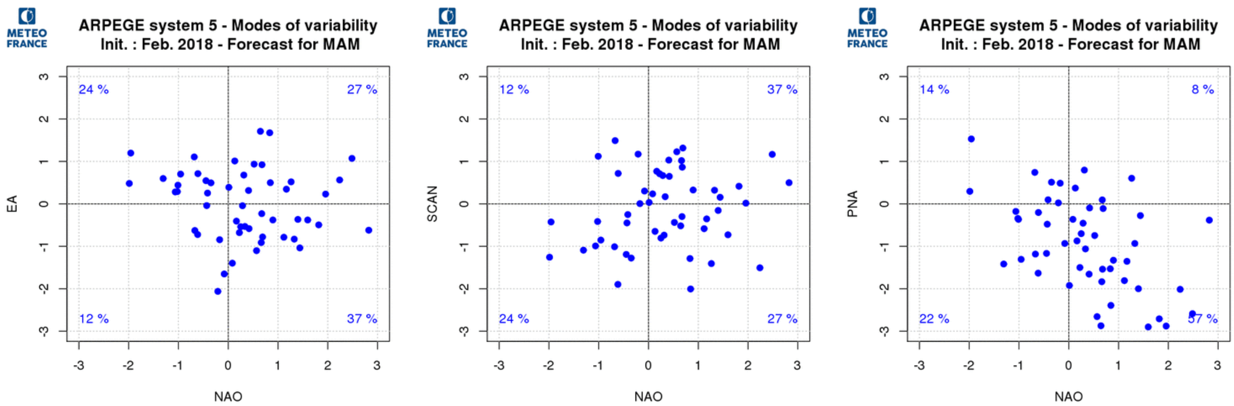


fig.II.2.c : modes of variability forcasts over the Northern hemisphere with Meteo-France MF-S5

II.2.d. weather regimes

Only MF-S5 forecasts are available.

The NAO + mean sea level weather regime is expected to be more frequent than normal with a climatological gap significant at 1%.

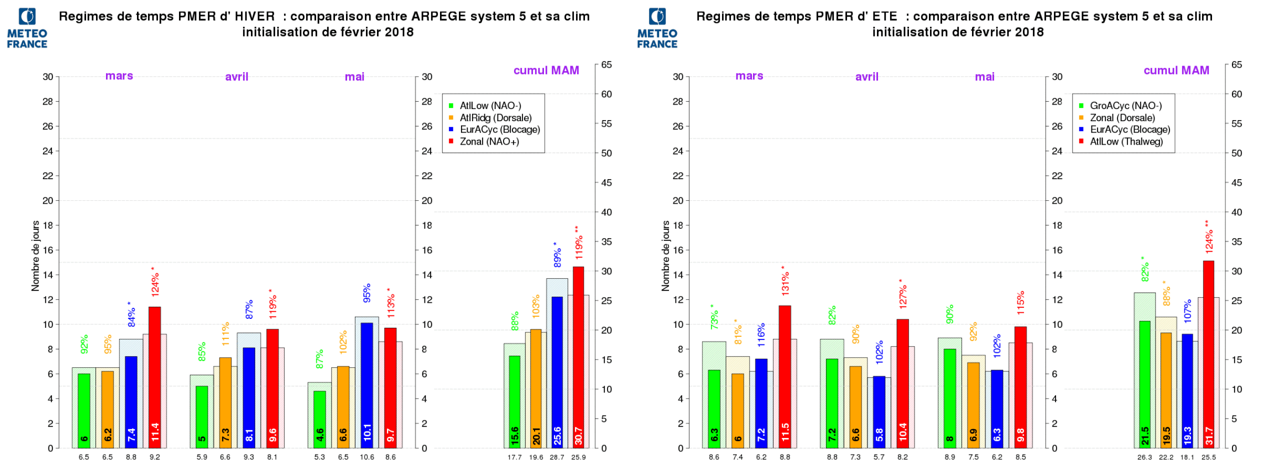


fig.II.2.d: North Atlantic Regime occurrence anomalies from Meteo-France MF-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

II.3. IMPACT: TEMPERATURE FORECASTS (figure II.3.1 to II.3.4)

The models predict warm anomalies in the northern hemisphere except in Greenland, western Canada and Alaska and southeastern Asia. For Europe, ECMWF-S5 has a much colder option than other models (in line with the mid-February monthly forecast).

The signal is generally weak for the continents in the southern hemisphere: South America, Africa and Australia.

II.3.a Météo-France

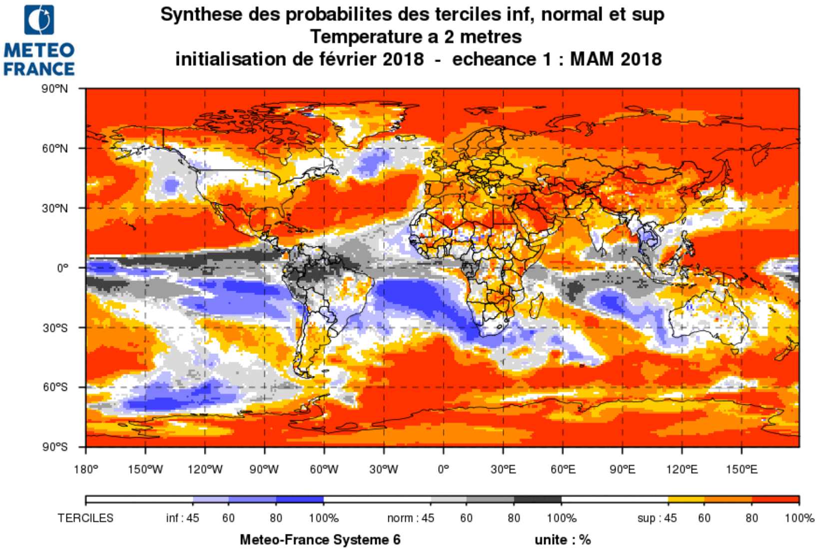


fig.II.3.1: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.b ECMWF

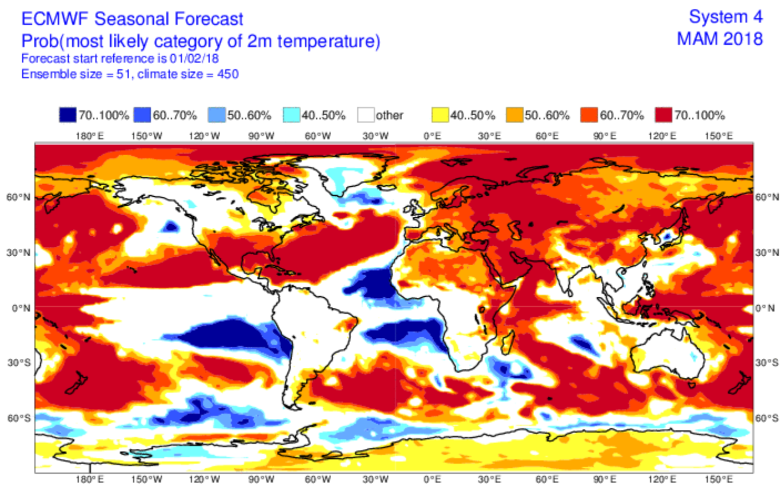


fig.II.3.2: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

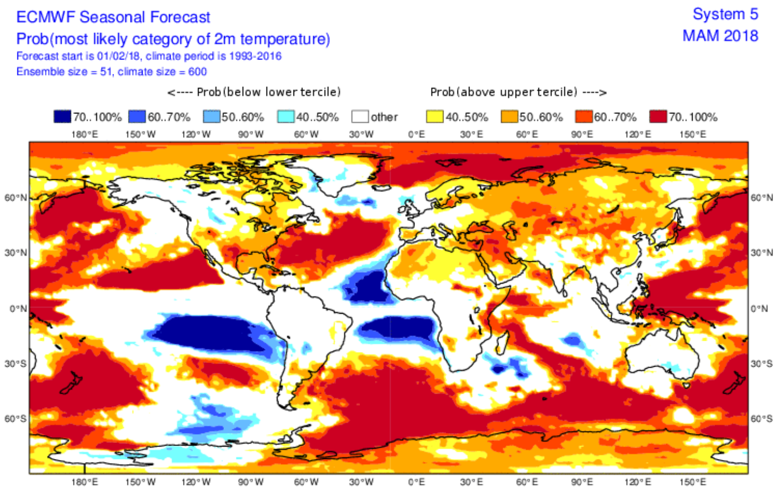


fig.II.3.2: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

II.3.c Japan Meteorological Agency (JMA)

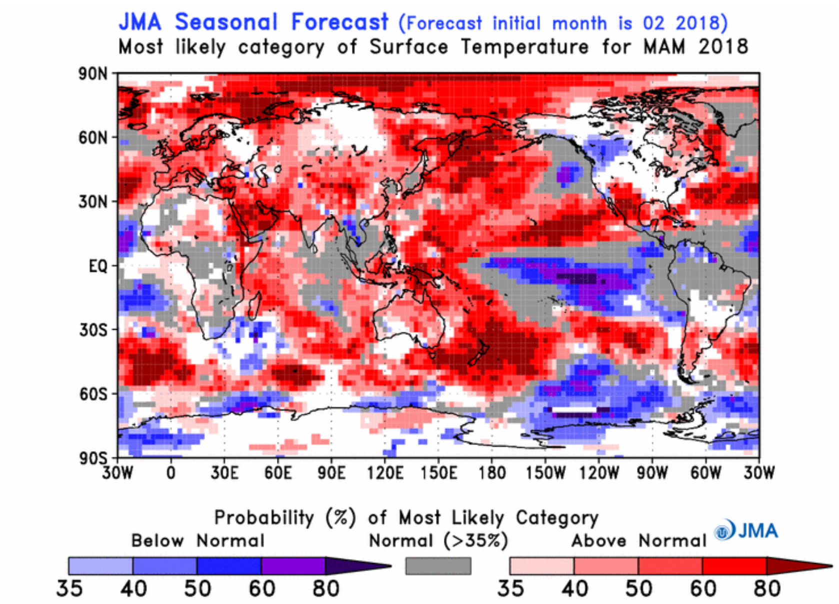


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal.
White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.3.d EUROSIP

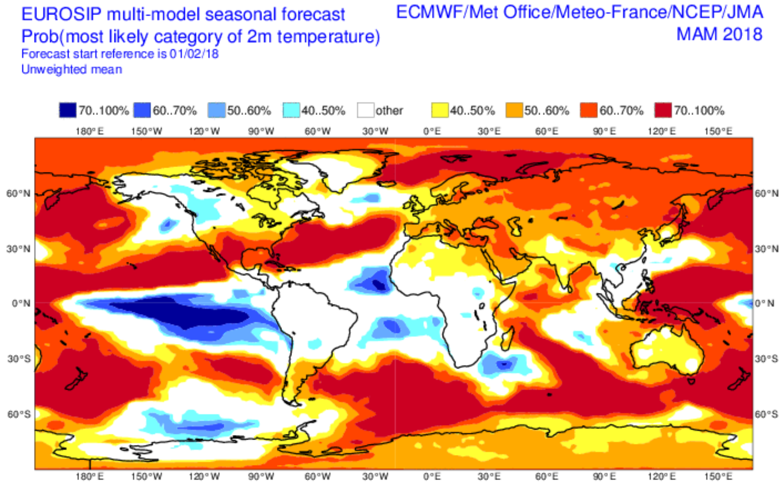


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EUROSIP (2 Categories, Below and Above normal
–
White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro
/seasonal_charts_2tm/

II.4. IMPACT : PRECIPITATION FORECAST

- Over Europe, the models continue to favor a north-south gradient with greater than normal precipitation over the north, and drier than normal conditions over the Mediterranean regions. The limit of precipitation penetration in continental Europe remains unclear. This scenario is consistent with a general situation favoring NAO + mode / mode.
- On other continents: little consistent large-scale signal.

II.4.a Météo-France

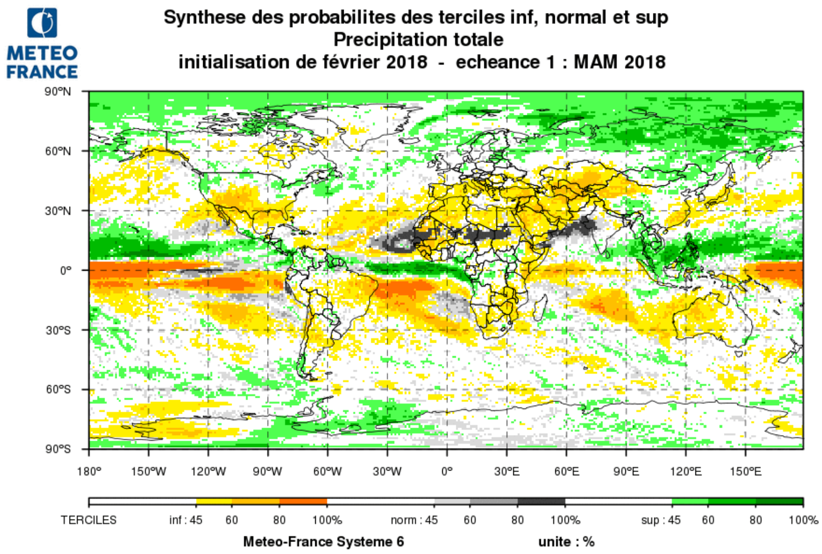


fig.II.4.1: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.b ECMWF

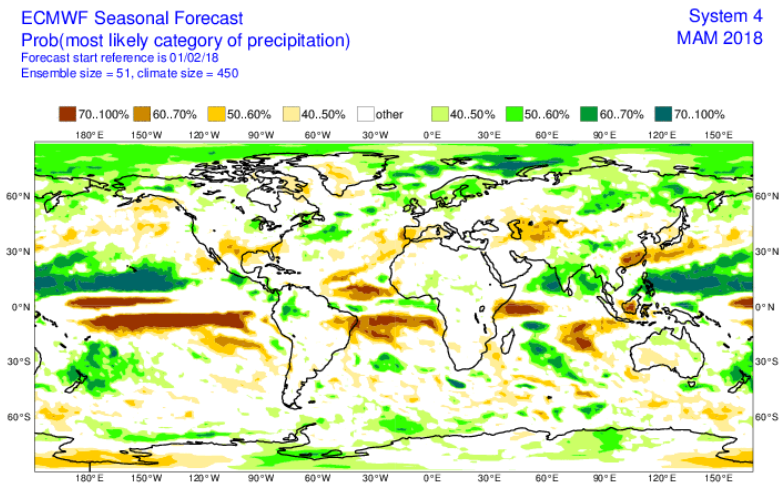


fig.II.4.2: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

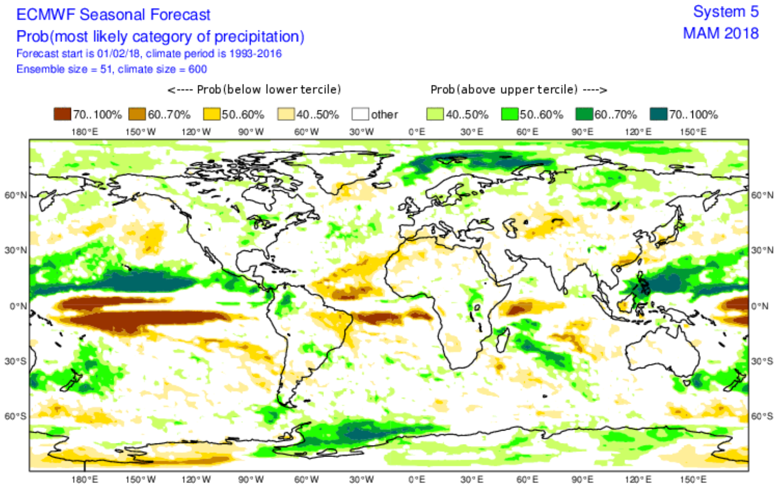


fig.II.4.2: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.4.c Japan Meteorological Agency (JMA)

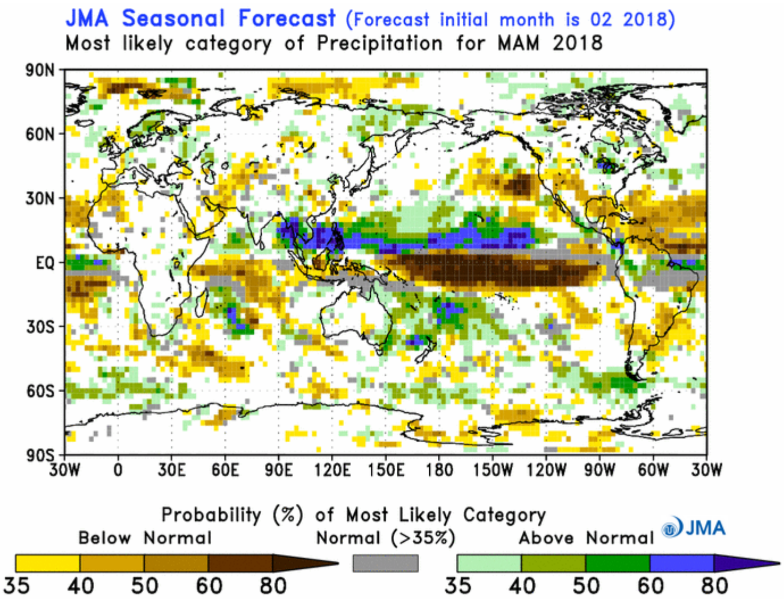


fig.II.4.3: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.4.d EUROSIP

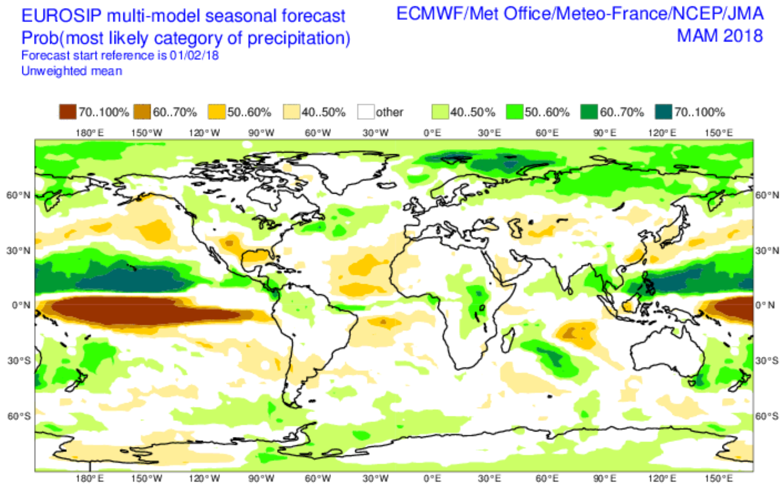


fig.II.4.4: Multi-Model Probabilistic forecasts for precipitation from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.5. REGIONAL TEMPERATURES and PRECIPITATION

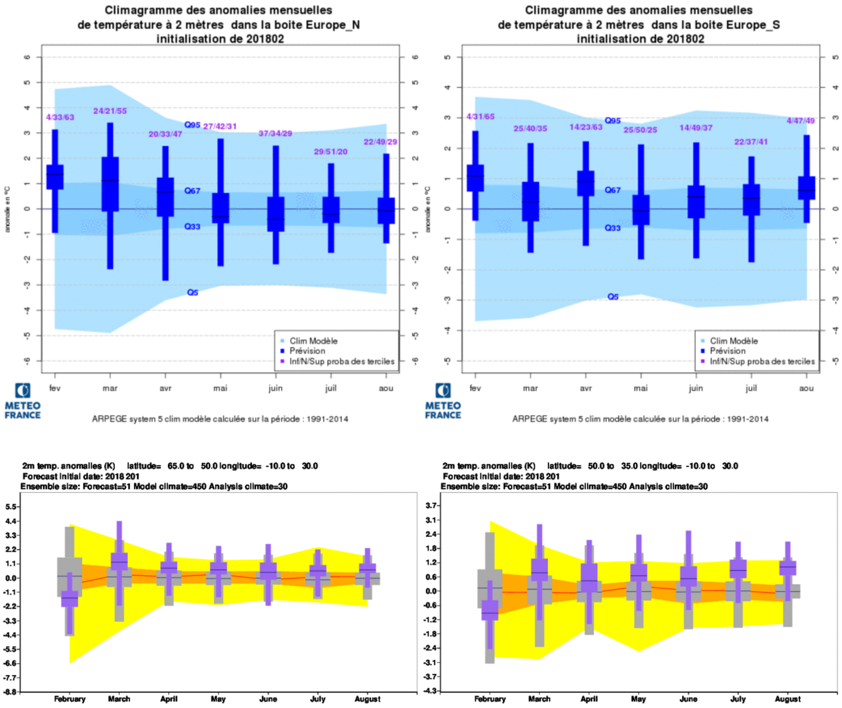


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

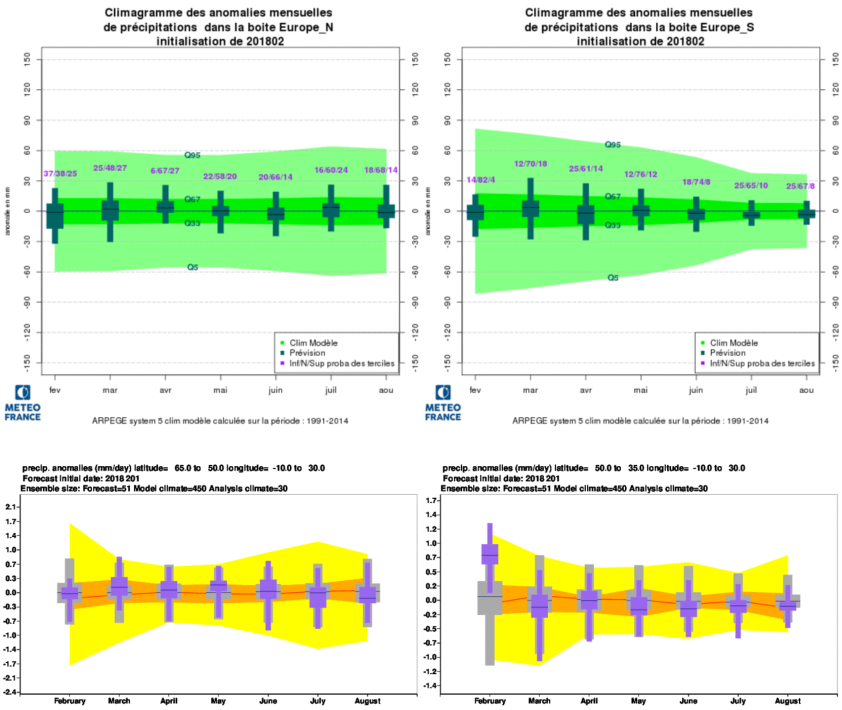


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.6. "EXTREME" SCENARIOS

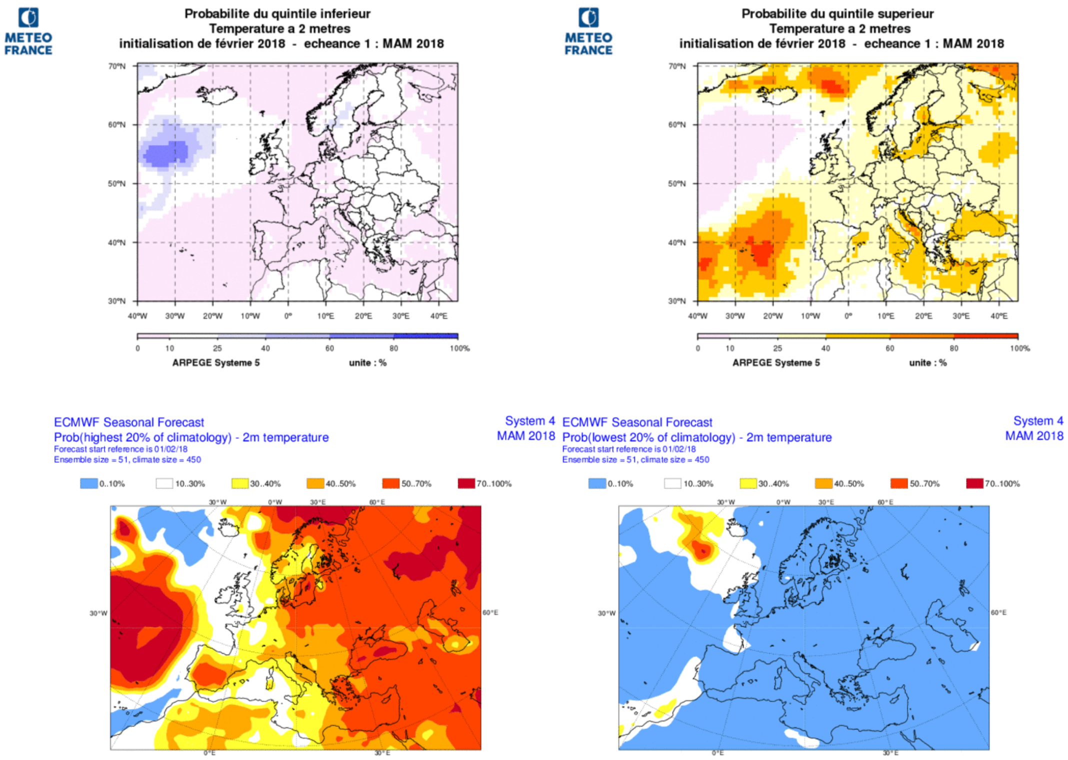


fig.II.6.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20% of the distribution) and "extreme" above normal conditions (right – lowest ~20% of the distribution).

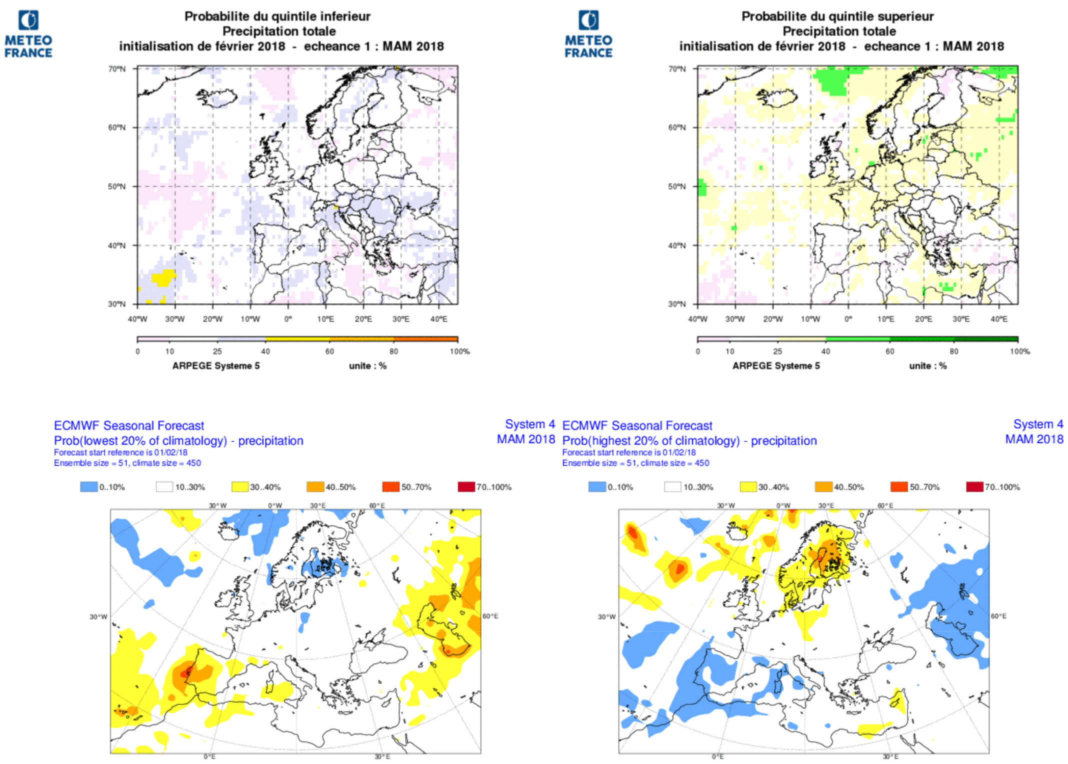
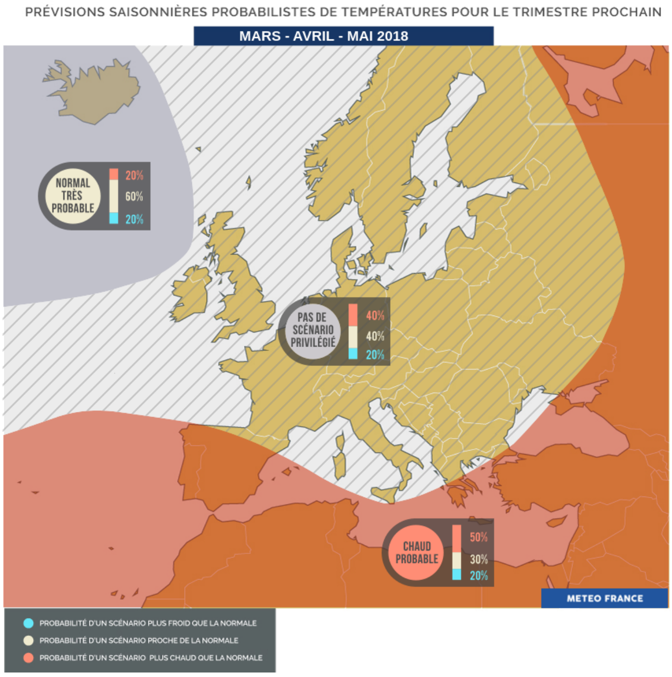


fig.II.6.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest ~20% of the distribution) and "extreme" above normal conditions (right – highest ~20% of the distribution).

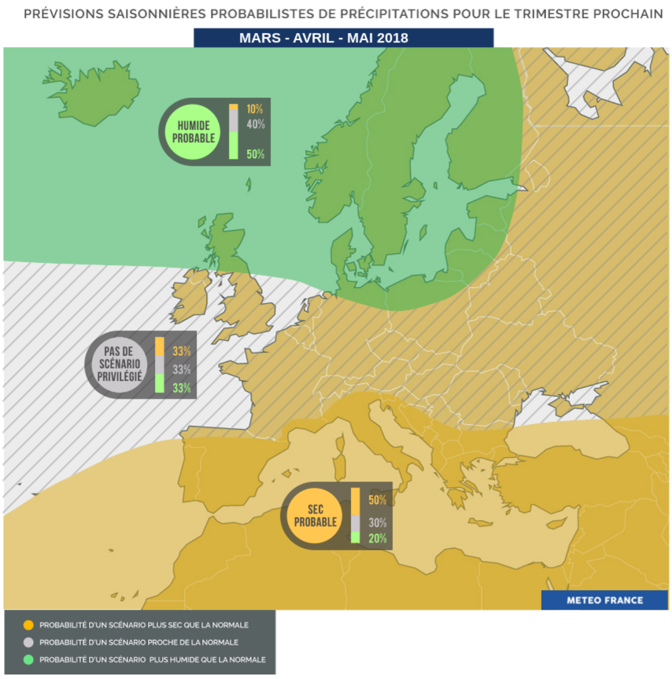
II.7. DISCUSSION AND SUMMARY

II.7.a Forecast over Europe

ECMWF-S5 deviates much from other models in Europe. The monthly forecast confirms its option for the beginning of the period. It is therefore not possible to choose a scenario over a large part of the continent. Only the extreme south and east of the area seems to be moving towards warmer than normal.



Precipitations : the north-south gradient should continue with rain deficit around the Mediterranean and an excess in the North of Europe. In between, the limit is difficult to determine, hence the central area with no scenario.



II.7.b Tropical cyclone activity

Under the influence of the negative phase of ENSO, the South Pacific is expected to experience weaker than normal cyclone activity. For the Indian Ocean, no significant difference to the normal activity of the end of the hurricane season.

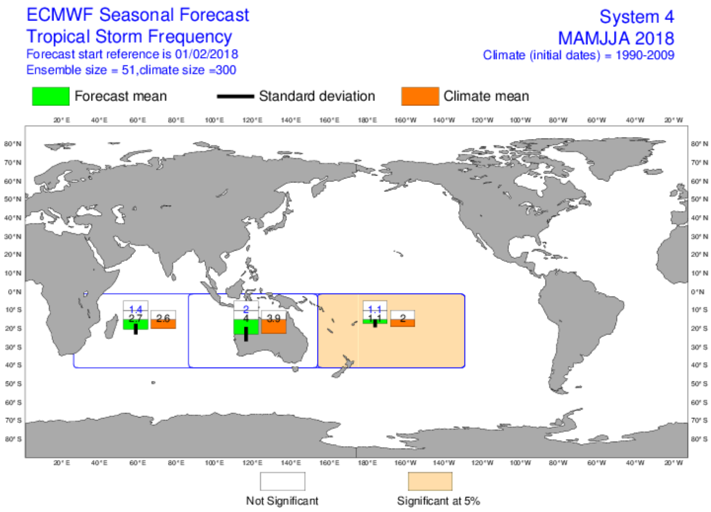


fig.II.7.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

III.1. Seasonal Forecasts

Presently several centers provide seasonal forecasts, especially those designated as Global Producing Centers by WMO (see http://www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html).

- BoM, CMA, CPTEC, ECMWF, JMA, KMA, Météo-France, NCEP and UK Met Office have ocean/atmosphere coupled models. The other centers have atmospheric models which are forced by a SST evolution which is prescribed for the entire period of forecast.
- LC-MME and Euro-SIP provide multi-model forecasts. Euro-Sip is presently composed using 5 models (ECMWF, MF, NCEP, UK Met Office and JMA). LC-MME uses information coming from most of the GPCs ; providing deterministic and probabilistic combinations of several coupled and forced models.

Seasonal forecasts use the ensemble technique to sample uncertainty sources inherent to these forecasts. Several Atmospheric and/or oceanic initial states are used to perform several forecasts with slightly different initial state in order to sample the uncertainty related to imperfect knowledge of the initial state of the climate system. When possible, the model uncertainty is sampled using several models or several version of the same model. The horizontal resolution of the Global models is currently between 100 and 300km. This mean that only Large Scale feature make sense in the interpretation of the issued forecasts. Generally speaking, the temperature forecasts show better skills than rainfall forecasts. Then, it exists a natural weakness of the seasonal predictability in Spring (ref to North Hemisphere).

In order to better interpret the results, it is recommended to look to verification maps and graphs which give some insight into the expected level of skill for a specific parameter, region and period. A set of scores is presented on the web-site of the Lead-Centre for Verification (see http://www.bom.gov.au/wmo/lrfvs/) ; scores are also available at the specific web site of each centers.

This bulletin collects all the information available the 21st of the current month preceding the forecasted 3-month period.

III.2. « NINO », SOI indices and Oceanic boxes

El Niño and La Niña events primarily affect tropical regions and are monitored by following the SST evolution in specific area of the equatorial Pacific.

- Niño 1+2 : 0°/10°S 80W-90W ; it is the region where the SST warming is developing first at the surface (especially for coastal events).

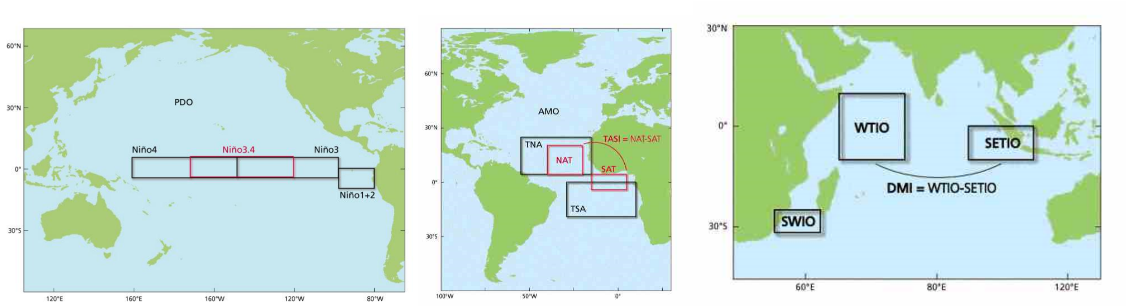
- Niño 3 : 5°S/5°N 90W-150W ; it is the region where the interanual variability of SST is the greatest.

- Niño 4 : 5°S/5°N 160E- 150W ; it is the region where SST evolution have the strongest relationship with evolution of convection over the equatorial Pacific.

- Niño 3.4 : 5°S/5°N 120W-170W ; it is a compromise between Niño 3 and Niño 4 boxes (SST variability and Rainfall impact).

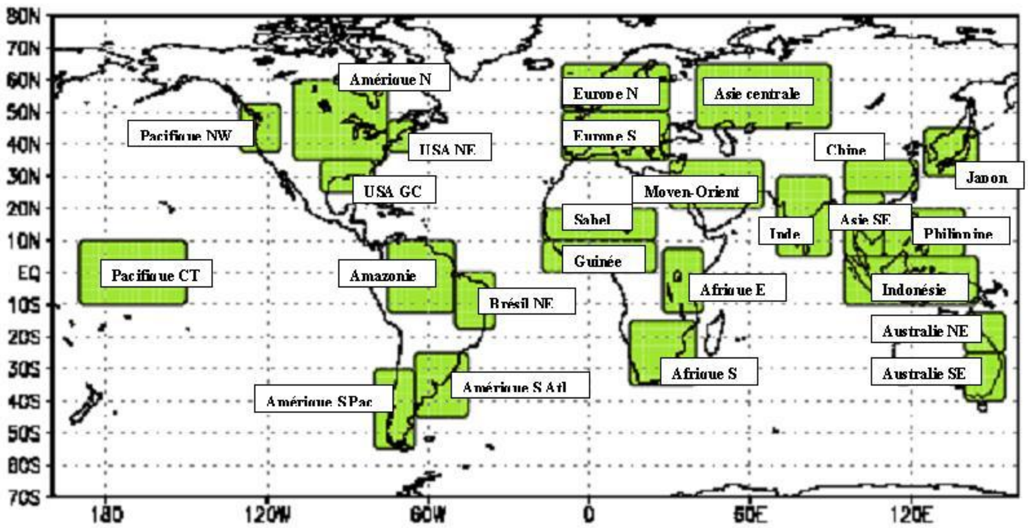
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea level pressure at Tahiti minus standardized sea level pressure at Darwin (see above figure). It represents the Walker (zonal) circulation and its modifications. Its sign is opposite to the SST anomaly meaning that when the SST is warmer (respectively colder) than normal (Niño respectively Niña event), the zonal circulation is weakened (respectively strengthened).

Oceanic boxes used in this bulletin :



III.3. Land Boxes

Some forecasts correspond to box averaged values for some specific area over continental regions. These boxes are described in the following map and are common to ECMWF and Météo-France.



III.4. Acknowledgement

This bulletin is edited by the RCC-LRF Node of the RCC Network in Toulouse for the RA VI. It is a joint effort of the RCC-Climate Monitoring Node (led by DWD) and the RCC-LRF Node (Co-Led by Météo-France).